

CLAIMS

1. An inertial sensor made of semiconductor material, comprising a stator element and a rotor element electrostatically coupled together; and actuator means made of semiconductor material, coupled to said rotor element and controlled so as to compensate the position offset of the rotor element.

2. The inertial sensor of Claim 1, wherein said actuator means comprise at least an actuator element comprising a first mobile arm extending from said rotor element and at least a fixed arm facing said first mobile arm.

3. The inertial sensor of Claim 2, wherein said first mobile arm is provided with a plurality of mobile electrodes extending transversely with respect to the first mobile arm towards said first fixed arm; and wherein said first fixed arm is provided with a plurality of fixed electrodes extending transversely with respect to the first fixed arm towards said first mobile arm.

4. The inertial sensor of Claim 3, wherein said mobile electrodes are arranged parallel to one another along said first mobile arm and in that said fixed electrodes are arranged parallel to one another along said first fixed arm and are interleaved with said mobile electrodes.

5. The inertial sensor of Claim 2, wherein said actuator element comprises a pair of said first fixed arms arranged on opposite sides of said first mobile arm.

~~6. The inertial sensor of Claim 2, wherein said actuator means comprise a plurality of said actuator elements.~~

7. The inertial sensor of Claim 6, wherein said rotor element has a circular structure and said actuator means comprise at least one pair of said actuator elements arranged on diametrically opposite sides of said rotor element.

8. The inertial sensor of Claim 7, wherein said actuator means comprise two actuator groups, each formed of at least two said actuator elements and arranged on diametrically opposite sides of said rotor element.

9. The inertial sensor of Claim 6, wherein said rotor element has a circular structure and said actuator means comprise four said actuator elements, each arranged in a respective quadrant of said rotor element.

10. The inertial sensor of Claim 9, wherein said actuator means comprise four actuator groups, each formed of at least two said actuator elements and each arranged in a respective quadrant of said rotor element.

11. The inertial sensor of Claim 1, wherein said rotor element comprises a suspended mass and a plurality of second mobile arms extending from said suspended mass, and said stator element comprises a plurality of second fixed arms, each facing a respective said second mobile arm.

12. The inertial sensor of Claim 11, wherein said stator element further comprises a plurality of third fixed arms, each facing a respective said second mobile arm, each second mobile arm being arranged between a respective second fixed arm and a respective third fixed arm.

13. A method for compensating the position offset of an inertial sensor made of semiconductor material and having a stator element and a rotor element electrostatically

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~~coupled together, comprising moving said rotor element to compensate for the position offset thereof.~~

14. The method of Claim 13, wherein said moving comprises driving at least one actuator element, made of semiconductor material, coupled to said rotor element.

15. The method of Claim 14, the actuator element having a mobile arm extending from said rotor element and at least one fixed arm facing said mobile arm, wherein said driving comprises applying a potential difference between said mobile arm and said fixed arm.

16. The method of Claim 15, wherein said applying a potential difference comprises generating an unbalancing signal correlated to the position offset of said rotor element and generating said potential difference as a function of said unbalancing signal.

17. The method of Claim 16, wherein said generating said potential difference comprises calculating the difference between said unbalancing signal and a reference signal and generating said potential difference as a function of said calculated difference.

18. The method of Claim 17, wherein said generating said potential difference comprises generating a digital correction word as a function of said difference between said unbalancing signal and a reference signal, and carrying out a digital-to-analog conversion of said digital correction word.

19. An inertial sensor, comprising:
a sensor element, comprising:

a stator;

a rotor; and

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an actuator formed on the sensor element, the actuator comprising a fixed arm connected to one of the stator and the rotor and a mobile arm connected to the other of the stator and the rotor, the actuator configured to adjust the positions of the stator and the rotor relative to one another in response to a driving signal.

20. The sensor of Claim 19, further comprising a driver circuit coupled to the sensor element and the actuator and configured to determine a position offset of the stator and the rotor relative to one another and to generate the driving signal in response thereto.

21. The sensor of Claim 20, wherein the stator and the rotor are configured to form a capacitive element that generate a first capacitive signal and a second capacitive signal, and wherein the driver circuit is coupled to the capacitive element and is configured to receive the first capacitive signal and the second capacitive signal and to generate a difference signal, the driver circuit further configured to compare the different signal to a reference signal and to generate the driving signal in response thereto.

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22. The sensor of Claim 20, wherein the stator and the rotor are configured to form a capacitive element that generate a first capacitive signal and a second capacitive signal, and wherein the driver circuit comprises a first amplifier stage coupled to the capacitive element and configured to receive the first and second capacitive signals and to generate first and second capacitive value signals; a second amplifier stage coupled to the first amplifier stage and configured to receive the first and second capacitive value signals and to generate the difference signal in response thereto.

23. The sensor of Claim 22, wherein the driver circuit further comprises a processing stage coupled to the second amplifier and configured to receive the difference signal and to compare the difference signal to the reference signal and to generate the driver signal in response thereto.

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24. The sensor of Claim 23, wherein the driver circuit further comprises a filter network coupled between the second amplifier stage and the processing stage, the filter network configured to receive the difference signal from the second amplifier stage and to output a modified difference signal having a value equal to the mean value of the difference signal.

25. The sensor of Claim 20, further comprising a connection stage coupled to the actuator and to the driver circuit, the connection stage configured to receive the driving signal and to selectively couple the driving signal to the actuator in response to the driving signal.